



## **Polymer Replication of a Randomly Nanostructured Insert with and without Induction Heating of the Mold**

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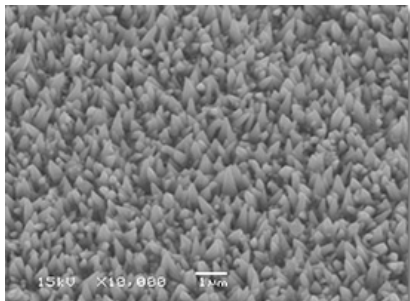
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# Polymer Replication of a Randomly Nanostructured Insert with and without Induction Heating of the Mold

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In today's industry, applications involving surface patterning with sub- $\mu\text{m}$  scale structures have shown a high interest. The replication of these structures by injection molding leads to special requirements for the mold in order to ensure proper replication and an acceptable cycle time.

This work investigates the applicability of induction heating embedded in the mold for the improvement of nano pattern replication. A tool insert, having a surface containing functional geometries in the sub-micrometer range, was produced using an innovative black nickel coating developed by Ebina Denka Kogyo (Japan). The result of the black nickel coating is a film which has low light reflection due of its complex surface and the optically black appearance is only due by its surface (no organic dye). The coating is also ultraviolet and heat resistant.



The main idea behind using this special coating was for decoration purposes. In fact, with structured coating in precise areas of the injection mold, it could in theory be possible to obtain different color perceptions on the replicated surface.

ABS was used for injection moulding and induction heating parameters were investigated after a preliminary optimization with standard heating conditions.

The replicated surfaces were qualitatively characterized by scanning electron microscopy and optical observation. The experimental results show that not even with the induction heating is it possible to replicate perfectly the micro geometry of the insert due its complexity. In the following picture it is possible to appreciate a partial replication of the geometry; the result is a very porous surface that it might be used for other technological purposes. Regarding the optical appearance is possible to appreciate that the polymer replica in the area with the coating is less shining compare to the areas without the coating.

